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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/577,347	05/24/2000	Maria Ronay	YOR9-2000-0109	5095

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EXAMINER	
SONG, MATTHEW J	

ART UNIT	PAPER NUMBER
1765	

DATE MAILED: 05/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/577,347	RONAY, MARIA	
	Examiner	Art Unit	
	Matthew J Song	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 March 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 13-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *13-36* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. This application contains claim 1 drawn to an invention nonelected with traverse in the Paper filed on 10/21/2001. A complete reply to the final rejection must include cancellation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 13-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Admission in view of Ronay (US 5,876,490).

Applicant's admitted prior art teaches in many microelectronics applications a Si_3N_4 layer is deposited under a SiO_2 layer to serve as a polish stop, particularly in Shallow Trench Isolation (STI) structures. Admission also teaches a layer of silicon dioxide, silicon nitride and/or silicon oxynitride insulator is located beneath a metal layers such as copper, tungsten or aluminum layer and a liner such as Ti, TiN, Ta and TaN to act as a polish stop and the liner can be removed. Admission also teaches using slurries such as silica slurry or ceria slurry (pg 2-3 of the instant specification)

Admission does not teach a slurry comprising abrasive particles and an anionic polyelectrolyte in an amount sufficient to increase the polish rate ratio of the silicon dioxide to the silicon nitride and contact with the surface of a polishing pad.

In a method of polishing, note entire reference, Ronay teaches a slurry comprises abrasive particles and a polyelectrolyte, where the polyelectrolyte is cationic when the abrasive particles are anionic and the polyelectrolyte is anionic when the abrasive particles are cationic (col 4, ln 55-65). Ronay also teaches polyacrylic acid, polymethacrylic acid, polymethylmethacrylic acid, polymaleic acid, polyvinylsulfonic acid, polyvinylamine, polyethylenimine and poly (4-vinylpryridine) (col 5, ln 25-40 and Table 1). Ronay also teaches the molecular weight of the polyelectrolyte is between about 500-10000 (col 6, ln 25-35). Ronay also teaches ceria, alumina, silica and zirconia abrasive particles at 1wt% (Example 2 and claim 14). Ronay also teaches 0.2 wt% polyacrylic acid (Example 2) and the slurry is an aqueous slurry (claim 15). Ronay also teaches planarization of aluminum, tungsten and copper (col 6, ln 50 to col 7, ln 10). Ronay also teaches a polishing pad (col 2, ln 30-40). Ronay also teaches the slurry results in reduced polishing rate at recesses while the abrasive particles maintain high polish rates at elevations, which leads to improved planarization in shallow trench isolation applications (Abstract and col 1, ln 25-67).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Admission with Ronay's slurry to improve planarization, as taught by Ronay.

The combination of Admission and Ronay is silent to the amount of polyelectrolyte is sufficient to increase the polishing rate ratio of the silicon dioxide to the silicon nitride.

However, the combination of Admission and Ronay teach a similar amount of abrasive particles, 1 wt%, and polyelectrolyte, 0.2 wt%, as applicant, note instant claims 24 and 26 and Example 2; therefore the amount of abrasive particles and polyelectrolyte is inherently sufficient to increase the polishing rate ratio of the silicon dioxide to the silicon nitride. Furthermore, the combination of Admission and Ronay teach the amount of polyelectrolyte and abrasive particles is selected to achieve planarization ('490 col 5, ln 14-25), which is a teaching that the amount of polyelectrolyte and abrasive particles is a result effective variable. Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Admission and Ronay to obtain same by conducting routine experimentation of a result effective variable (MPEP 2144.05).

Referring to claims 14,22, and 28-29, the combination of Admission and Ronay teach the polyelectrolyte has a molecular weight of about 500-10000. Overlapping ranges is held to be obvious (MPEP 2144.05).

Referring to claims 17, 24, 26, 31, and 33, the combination of Admission and Ronay teach 1 wt% of abrasive particles and 0.2 wt% polyelectrolyte, this reads on applicant's abrasive particles is about 0.3-2 wt% and the amount of polyelectrolyte is about 0.05-5 wt%.

Referring to claims 25, 27, 32, and 34, the combination of Admission and Ronay teach 1 wt% of abrasive particles and 0.2 wt% polyelectrolyte, but is silent to the range of the amount of polyelectrolyte and abrasive particles. The combination of Admission and Ronay teach the amount of polyelectrolyte and abrasive particles is selected to achieve planarization ('490 col 5, ln 14-25), which is a teaching that the amount of polyelectrolyte and abrasive particles is a result effective variable. Therefore, it would have been obvious to a person of ordinary skill in the art

at the time of the invention to modify the combination of Admission and Ronay to obtain same by conducting routine experimentation of a result effective variable (MPEP 2144.05).

4. Claims 13-17, 22-27, 30-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tseng (US 5,801,082) in view of Ronay (US 5,876,490).

Tseng teaches a method of making a shallow trench isolation (STI) comprising a Si_3N_4 layer **14** and a silicon oxide layer **22**, SiO_2, deposited to fill trenches **4** and is chemical/mechanically polished back to the surface of the Si_3N_4 layer **14**. Tseng also teaches the layer **22** is deposited to a thickness sufficient to fill the trenches and to a height tat extends above the surface of the Si_3N_4 layer (col 4, ln 1 to col 5, ln 25).

Tseng does not teach a slurry comprising abrasive particles and an anionic polyelectrolyte in an amount sufficient to increase the polish rate ratio of the silicon dioxide to the silicon nitride and contact with the surface of a polishing pad.

In a method of polishing, note entire reference, Ronay teaches a slurry comprises abrasive particles and a polyelectrolyte, where the polyelectrolyte is cationic when the abrasive particles are anionic and the polyelectrolyte is anionic when the abrasive particles are cationic (col 4, ln 55-65). Ronay also teaches polyacrylic acid, polymethacrylic acid, polymethylmethacrylic acid, polymaleic acid, polyvinylsulfonic acid, polyvinylamine, polyethylenimine and poly (4-vinylpryridine) (col 5, ln 25-40 and Table 1). Ronay also teaches the molecular weight of the polyelectrolyte is between about 500-10000 (col 6, ln 25-35). Ronay also teaches ceria, alumina, silica and zirconia abrasive particles at 1wt% (Example 2 and claim 14). Ronay also teaches 0.2 wt% polyacrylic acid (Example 2) and the slurry is an aqueous slurry

(claim 15). Ronay also teaches a polishing pad (col 2, ln 30-40). Ronay also teaches the slurry results in reduced polishing rate at recesses while the abrasive particles maintain high polish rates at elevations, which leads to improved planarization in shallow trench isolation applications (Abstract and col 1, ln 25-67).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Tseng with Ronay's slurry to improve planarization, as taught by Ronay.

The combination of Tseng and Ronay teach raised region of SiO_2 **22** and lower regions of Si_3N_4 **22** and the ratio of abrasive particles and polyelectrolyte is selected to result in reduced polishing rate at recesses and high polish rate at elevation, this reads on applicant increase the polishing rate ratio of the silicon dioxide to the silicon nitride. Furthermore, the combination of Admission and Ronay teach a similar amount of abrasive particles, 1 wt%, and polyelectrolyte, 0.2 wt%, as applicant, note instant claims 24 and 26 and Example 2; therefore the amount of abrasive particles and polyelectrolyte is inherently sufficient to increase the polishing rate ratio of the silicon dioxide to the silicon nitride

The combination of Tseng and Ronay teach the polyelectrolyte has a molecular weight of about 500-10000. Overlapping ranges is held to be obvious (MPEP 2144.05).

The combination of Tseng and Ronay teach 1 wt% of abrasive particles and 0.2 wt% polyelectrolyte, but is silent to the range of the amount of polyelectrolyte and abrasive particles. The combination of Tseng and Ronay teach the amount of polyelectrolyte and abrasive particles is selected to achieve planarization ('490 col 5, ln 14-25), which is a teaching that the amount of polyelectrolyte and abrasive particles is a result effective variable. Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the

combination of Tseng and Ronay to obtain same by conducting routine experimentation of a result effective variable (MPEP 2144.05).

5. Claims 18-21 and 28-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Booth (US 5,814,236) in view of Ronay (US 5,876,490).

Booth teaches a silicon dioxide layer **28**, this reads on applicant's member, and aluminum plugs **36**, this reads on applicant's metal surface, are subjected to a chemical mechanical planarization technique with a slurry and polishing pad, where the aluminum plugs are elevated above the surface of the silicon dioxide layer (col 4, ln 5-45 and Fig 5).

Booth does not teach a slurry comprising abrasive particles and an cationic polyelectrolyte in an amount sufficient to increase the polish rate ratio of the metal to the member.

In a method of polishing, note entire reference, Ronay teaches a slurry comprises abrasive particles and a polyelectrolyte, where the polyelectrolyte is cationic when the abrasive particles are anionic and the polyelectrolyte is anionic when the abrasive particles are cationic (col 4, ln 55-65). Ronay also teaches polyacrylic acid, polymethacrylic acid, polymethylmethacrylic acid, polymaleic acid, polyvinylsulfonic acid, polyvinylamine, polyethylenimine and poly (4-vinylpryridine) (col 5, ln 25-40 and Table 1). Ronay also teaches the molecular weight of the polyelectrolyte is between about 500-10000 (col 6, ln 25-35). Ronay also teaches ceria, alumina, silica and zirconia abrasive particles at 1wt% (Example 2 and claim 14). Ronay also teaches 0.2 wt% polyacrylic acid (Example 2) and the slurry is an aqueous slurry (claim 15). Ronay also teaches planarization of aluminum, tungsten and copper (col 6, ln 50 to

col 7, ln 10). Ronay also teaches a polishing pad (col 2, ln 30-40). Ronay also teaches the slurry results in reduced polishing rate at recesses while the abrasive particles maintain high polish rates at elevations, which leads to improved planarization in shallow trench isolation applications (Abstract and col 1, ln 25-67).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Booth with Ronay's slurry to improve planarization, as taught by Ronay.

The combination of Booth and Ronay teach raised region of aluminum **36** and lower regions of Silicon dioxide **28** and the ratio of abrasive particles and polyelectrolyte is selected to result in reduced polishing rate at recesses and high polish rate at elevation, this reads on applicant increase the polishing rate ratio of the metal to the member. Furthermore, the combination of Booth and Ronay teach a similar amount of abrasive particles, 1 wt%, and polyelectrolyte, 0.2 wt%, as applicant, note instant claims 24 and 26 and Example 2; therefore the amount of abrasive particles and polyelectrolyte is inherently sufficient to increase the polishing rate ratio of the silicon dioxide to the silicon nitride

The combination of Booth and Ronay teach the polyelectrolyte has a molecular weight of about 500-10000. Overlapping ranges is held to be obvious (MPEP 2144.05).

The combination of Booth and Ronay teach 1 wt% of abrasive particles and 0.2 wt% polyelectrolyte, but is silent to the range of the amount of polyelectrolyte and abrasive particles. The combination of Booth and Ronay teach the amount of polyelectrolyte and abrasive particles is selected to achieve planarization ('490 col 5, ln 14-25), which is a teaching that the amount of polyelectrolyte and abrasive particles is a result effective variable. Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the

combination of Booth and Ronay to obtain same by conducting routine experimentation of a result effective variable (MPEP 2144.05).

Response to Arguments

6. Applicant's arguments filed 3/17/2004 have been fully considered but they are not persuasive.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). The prior art submission is not relied upon as a teaching of how to achieve increased polishing rate ratios. This limitation is taught by Ronay. Ronay teaches a slurry with a similar composition taught by applicant. Therefore, a similar slurry composition inherently would have the same effect of increasing the polishing ratio.

In response to applicant's argument that Ronay does not teach the slurry composition could or should be used in a polishing process to enhance the polish rate ratio of silicon dioxide to silicon nitride or the polishing rate ratio of melt to silicon dioxide, silicon nitride and/or silicon oxynitride depending upon the type of polyelectrolyte employed, the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985). Ronay teaches a cationic polyelectrolyte slurry and an anionic polyelectrolyte slurry (col 4, ln 55-65 and col 5, ln 20-55).

Ronay also teaches a similar amount of abrasive particles and polyelectrolyte; therefore the amount of abrasive particles and polyelectrolyte is inherently sufficient to increase the polishing ratio of silicon dioxide to silicon nitride. The composition of the slurry was known in the art to improve planarization processes prior to applicant's invention. The enhancement to the polishing ratio would have naturally flowed from the prior art by using the slurry composition taught by Ronay.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). Ronay teaches an improved slurry composition useful in polishing surfaces in the microelectronics industry (col 1, ln 10-20), which contains cationic or anionic polyelectrolytes (col 4, ln 55-65). The conventional process was taught by the primary references and the motivation to use Ronay's improved slurry came from the prior art teachings, not from hindsight, as alleged by applicant.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Ronay (EP 0846740) is equivalent to Ronay (US 5,876,490) and is published in 1998.

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 571-272-1468. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Matthew J Song
Examiner
Art Unit 1765

MJS

NADINE G. NORTON
SUPERVISORY PATENT EXAMINER